

TECHNICAL FIELD

The present invention relates to heads for gasoline internal combustion engines in having four valves per cylinder with the spark plug centered between the valves and push rods communicating directly with rocker arms actuating the valves.

BACKGROUND ART

Engines having four valves per cylinder with each valve pair operated by a single rocker arm having an actuating finger for each valve, have required the periodic manual adjustment of each valve to restore proper operational clearances. This invention, using a pivoting yoke between pairs of same function valves automatically compensate to maintain constant contact with the valve stem ends, a necessary condition for the use of hydraulic tappets. Diesel engines with four valves per cylinder, and a single pushrod for each function, commonly use a rocker arm having a single finger, which actuates a "T" shaped beam straddling the paired valves. The stabilizing vertical leg of the "T" shaped beam, restrained from any deflection from its reciprocating line of motion, precludes the use of hydraulic tappets.

A search of the prior art did not disclose any patents that read directly on the claim of the instant invention, however, the following U.S. patents were considered related:

PAT. NO.	INVENTOR	ISSUED
4,819,591	Valentine	April 17, 1989
4,023,543	Ishikawa	May 17, 1977
3,884,199	Irimajiri et al	May 20, 1975
2,884,913	Heintz	May 5, 1959
2,863,429	Bouteleux	December 9, 1958
2,700,966	Hofer	February 1, 1955
5,007,387	Arao	April 16, 1991
5,682,849	Regueiro	November 4, 1997

Valentine teaches a plurality of poppet valves positioned by their stems, which are not all parallel. A rocker is mounted such that a rocking axis is produced transverse to each stem axis and the tappet elements are not on the same plane through the rocker axis.

Each valve has an intermediate lift travel and the rocker axis is in line with the point of engagement with the tappet having the end face of the valve stem perpendicular to the valve stem axis.

Ishikawa discloses an auxiliary valve preventing any communication to the cylinder until the auxiliary valve has been lifted beyond a predetermined point.

Irimajiri et al utilize a valve operating system having main and auxiliary rocker arms for operating valves, each having a common upper tappet, push rod and lower cam operated tappet connected by a ball and socket joint. A similar cam operated assembly is provided for the exhaust valve, which also employs a rocker arm for actuation.

Heintz teaches an internal combustion engine with the spark plug positioned between the intake and exhaust valve.

Hofer uses one rocker arm pivoted on either side of the cylinder head with a pivoted lever linkage arranged across the cylinder head opposite the camshaft with two inlet and two outlet valves disclosed.

Arao discloses a four valve head with rocker arms having fingers attached for operation of each valve, however this arrangement requires periodic adjustment of the valve operating clearances. It cannot effectively use a single hydraulic tappet for each pair of valves.

Regueiro also uses a yoke or bridge to activate both valves of either intake or exhaust simultaneously, however requires a dihedral shaped bridge to maintain centralized activation of the valve, to negate the decentralizing effects on it due to the substantial transverse and longitudinal forces acting on its actuating contact area at the valves. Also, his bridge requires the formation of a combination of a spherical and sliding connection on each of its ends, due again to the substantial transverse and longitudinal forces acting at the valve actuating contact areas.

DISCLOSURE OF THE INVENTION

The object of the invention is to provide a cylinder head utilizing four valves with the spark plug in the center with the single finger rocker arm actuating a same function pair of valves through a pivoting yoke. This pivoting action automatically eliminates clearances to develop between the ends of the valve stems and the corresponding contacts of the yoke. This is a necessary condition to allow the effective application of the hydraulic tappet.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross-sectional view of the head taken along a typical valve arrangement illustrating the valves, spark plug, rocker arm, rocker arm shafts and push rods.

FIG. 2 is a cross sectional view taken along lines 2-2 illustrating in plan view the valve rocker arm and yoke arrangement.

FIG. 3 is view of the combustion chamber side depicting the valve and spark plug as they enter the combustion chamber and also the arrangement of the pushrods entering the head from the engine block.

FIG. 4 is a detailed view of the yoke 54 having slots 58 engaging the valve ends to stabilize the yoke 54 from rotation in a plane normal to the axis of the paired valves

valves **38** and the top surface of these slots providing a contact surface against the ends of the valves **36** and **38** while another contact surface **60** forms the bottom of the rocker arm **40** engagement opening **64**, centralized on the yoke **54** having freedom only to pivot in line of the parallel stem axis of the valves **36** or that of valves **38** for elimination of any space between all contact surfaces and mating components, thus establishing the necessary conditions for the use of hydraulic tappets.

BEST MODE FOR CARRYING OUT THE INVENTION

The best mode for carrying out the invention is presented in terms of a preferred embodiment and is illustrated in FIGS. 1 thru 3. The head **20** has a pair of exhaust valve ports **22** with seats **24** and a pair of intake valve ports **26** also with seats **28**. The seats are alternatively formed with bushings, as depicted in FIG. 1.

The head **20** further contains a plurality of push rod passages **30** in linear alignment with the hydraulic valve lifters (not shown) one passage **30** for each pair of valves. Further, a threaded hole **32** for the spark plug is centrally located between the valves in the general area the ports **22** and **26** with the hole **32** recessed and the area thereunder forming a combustion chamber **34**.

A pair of exhaust valves **36** are transversely parallel but are disposed at **25** to **35** degrees from the cylinder centerline and are contiguous with the exhaust valve port **22** and seat **24**. FIG. 1 and 3 illustrate this positioning relationship.

A pair of equal length inlet valves **38** are parallel to each other and are disposed angularly with respect to each cylinder in the engine and are contiguous with the intake port **26** and seat **28** again. FIGS. 1 and 2 depict this configuration. The angularity is obviously kept a minimum, however, it has been found that an angle "a" as shown in FIG 1, of 25 to 35 degrees is acceptable, with 30 degrees preferred.

A plurality of s rocker arms **40** with valve springs **42** are each attached to the stem **44** of the exhaust and inlet valves **36** and **38** for returning the valve to the seat **24** and **28** in the head **20**. The springs **42** assist in returning the valves to the closed position and the pressure of combustion forces the valve into a tight relationship with the seat sealing the ports **22** and **26**. Air cooling fins are shown as **56** and the valve cover as **58**.

Rocker arm shafts **46** retain the rocker arms **40**, one for each set of exhaust valves **36**, and the other for the inlet valves **38**.

A number of push rods **50** are positioned in the passages **30**, as shown pictorially in **FIG. 1** and are in alignment with a rocker arm **40** and it in turn with a yoke **54** such that each pair of valve are lifted simultaneously from the head **20** in sequence producing a timed cyclic allowing function of the reciprocating engine.

It will be noted that the use of the freely pivoting yoke **54** is critical to the invention and is the novelty.